MANAGING DIRECTORS
MATTHEW PALAVIDIS
VICTOR FATTORETTO

DIRECTORS
MATTHEW SHIELDS
BEN WHITE

Camden Medical Campus Precinct, Gledswood Hills

Concept DA Acoustic Assessment

SYDNEY
A: 9 Sarah St Mascot NSW 2020
T: (02) 8339 8000
F: (02) 8338 8399

SYDNEY MELBOURNE BRISBANE CANBERRA
LONDON DUBAI SINGAPORE GREECE

www.acousticlogic.com.au
ABN: 11 068 954 343

DOCUMENT CONTROL REGISTER

Project Number	20160742.1
Project Name	Camden Medical Campus Precinct, Gledswood Hills
Document Title	Concept DA Acoustic Assessment
Document Reference	20160742.1/2906A/R3/MF
Issue Type	Email
Attention To	Cyre Projects Pty Ltd Mr Mark Sweeney

Revision	Date	Document Reference	Prepared By	Checked By	Approved By
0	27/05/2016	20160742.1/2705A/R0/MF	MF		
1	17/06/2016	20160742.1/1706A/R1/MF	MF		
2	21/06/2016	20160742.1/2106A/R2/MF	MF		GW
3	29/06/2016	20160742.1/2906A/R3/MF	MF		GW

TABLE OF CONTENTS

1 INTRODUCTION

This report presents our environmental noise and vibration assessment for the concept development application for the medical precinct located at Gregory Hills Corporate Park. The major noise issues related to the proposed development are below:

- External noise intrusion into the proposed development shall comply with the requirements of Australian Standard AS:2107:2000 and NSW Road Noise Policy.
- Vibration produced from the operation of the proposed site shall comply with the requirements of NSW EPA's document "Assessing Vibration: A Technical Guideline 2006".
- Noise emission from the project site shall comply with the requirements of NSW EPA Industrial Noise Policy.

We note that the engagement for Acoustic Logic is to undertake an acoustic feasibility study. This study is to ensure that the concept for the proposed precinct is a viable option for the client but also for the surrounding neighbours. During the length of this project separate detailed development applications will be submitted to ensure detailed design is compliant with the requirements in which need to be applied.

The purpose of this report is to respond to the NSW Department of Planning and Environment's letter SSD 7387, SEARs for Camden Medical Campus Precinct. In particular, item number eight, Noise and Vibration.

> *8. Noise and Vibration*
>
> *Identify the main noise and vibration generating sources and outline measures to minimise and mitigate potential noise and vibration impacts on surrounding occupiers of land.*
>
> → *Relevant Policies and Guidelines:*
>
> - *NSW Industrial Noise Policy (EPA);*
> - *Assessing Vibration: A Technical Guideline 2006*

This assessment has been based on architectural drawings provided by Health Projects International, dated 1st June 2016, revision Concept DA.

2 SITE DESCRIPTION

The proposed private hospital is to be located at Gregory Hills Corporate Park. Proposed site is surrounded by the following developments;

- North of the proposed site is Digitara Drive, which is a proposed road to service the project site but also surrounding developments. Further north of the project site is existing residential housing.

- East of the proposed site is The Hermitage Way, this is an existing road which carries a medium volume of traffic. Further this is existing low density residential housing.

- South of the proposed site is Gregory Hills Drive, which carries a high volume of traffic. Further this is proposed commercial developments.

- West of the proposed site is a Riparian Zone which will be used as a drainage reserve for the local environment, further this is a proposed road known as Road 8, further this is proposed commercial buildings.

The concept development proposal is to construct a Medical precinct on the site which will include a basement level for 76 vehicles, a five level hospital building which will contain patient rooms and mixed medical commercial suites. Additionally, to the south of the main hospital building will be a five level multi storey parking station. Located on the eastern boundary on ground level will be an external open air car park containing 210 spaces. Along the western boundary of the site will be an additional open air 25 car parking station. Hospital services including ambulance drop off, loading dock and base building services will be located along the northern boundary of the building and boundary line. A proposed ground floor layout can be found in Figure 2. A site map can be found in Figure 1.

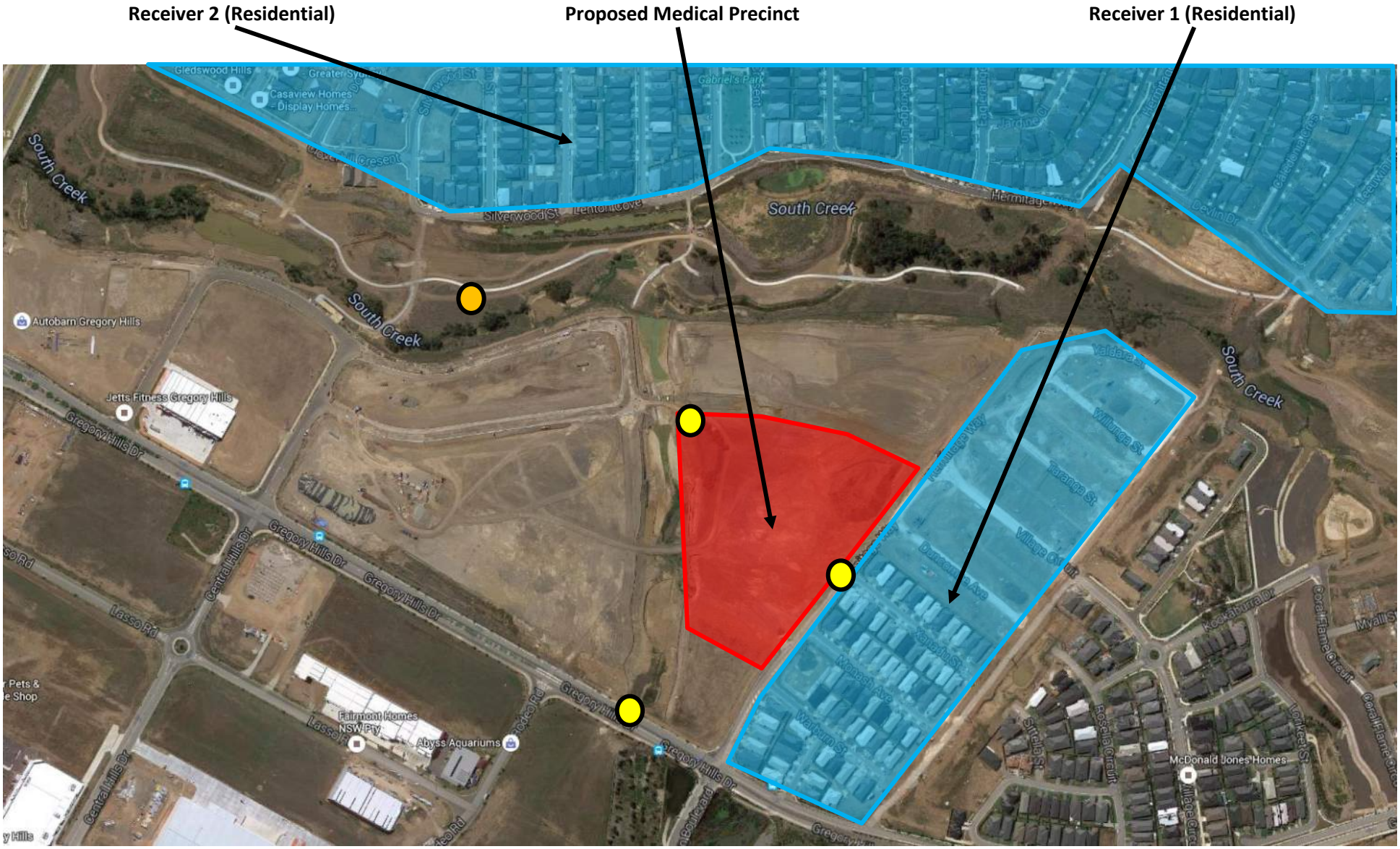


Figure 1 – Site Map

Attended Noise Measurement

Unattended Noise Measurement

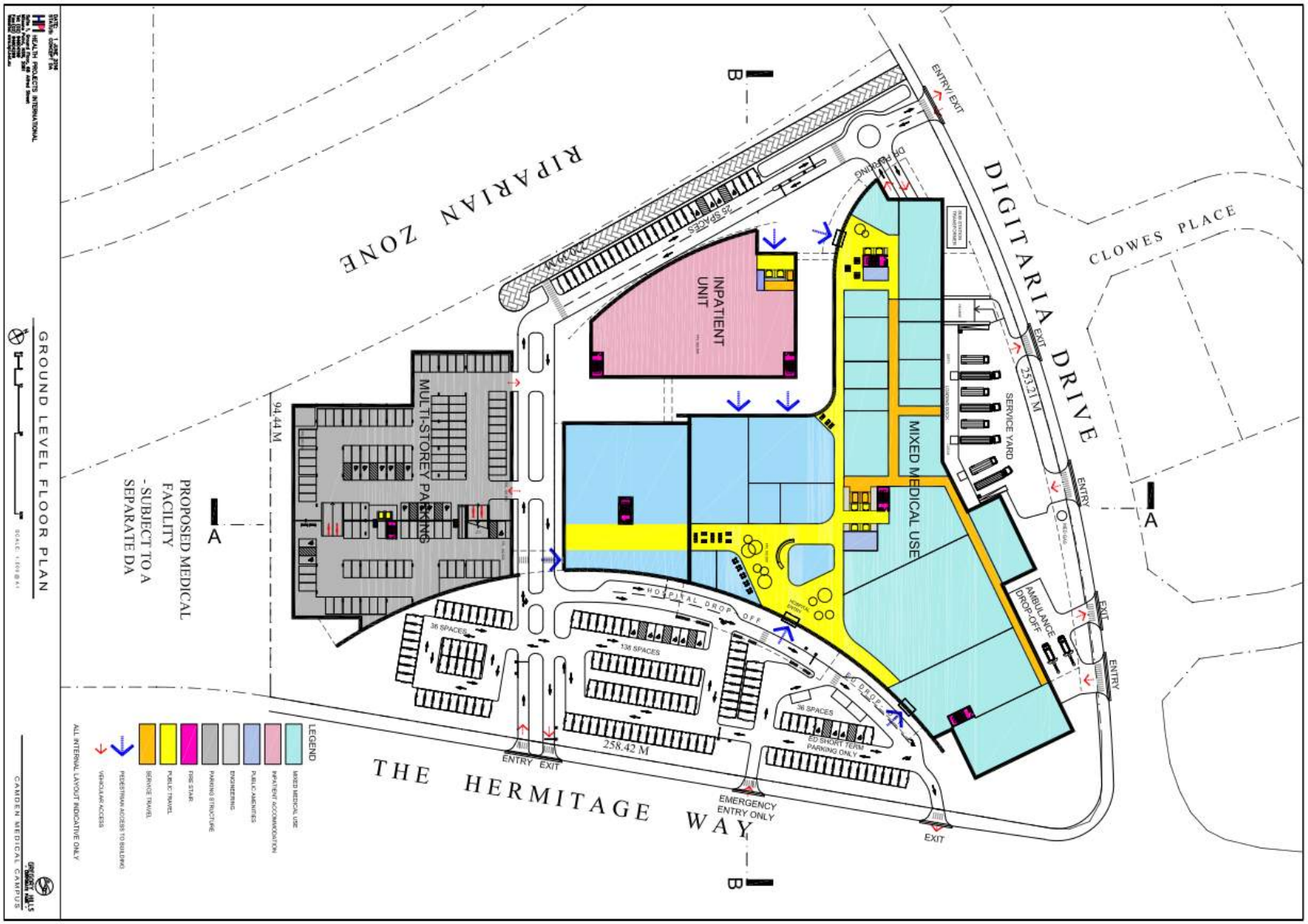


Figure 2 – Proposed Medical Precinct Development Ground Floor Plan

3 NOISE DESCRIPTORS

Traffic noise constantly varies in level, due to fluctuations in traffic speed, vehicle types, road conditions and traffic densities. Accordingly, it is not possible to accurately determine prevailing traffic noise conditions by measuring a single, instantaneous noise level. To accurately determine the effects of traffic noise a 15-20 minute measurement interval is utilised. Over this period, noise levels are monitored on a continuous basis and statistical and integrating techniques are used to determine noise description parameters. These parameters are used to measure how much annoyance would be caused by a particular noise source.

In the case of environmental noise three principle measurement parameters are used, namely L_{10}, L_{90} and L_{eq}.

The L_{10} and L_{90} measurement parameters are statistical levels that represent the average maximum and average minimum noise levels respectively, over the measurement intervals. The L_{10} parameter is commonly used to measure noise produced by a particular intrusive noise source since it represents the average of the loudest noise levels produced at the source. Conversely, the L_{90} level (which is commonly referred to as the background noise level) represents the noise level heard in the quieter periods during a measurement interval. The L_{90} parameter is used to set the allowable noise level for new, potentially intrusive noise sources since the disturbance caused by the new source will depend on how audible it is above the pre-existing noise environment, particularly during quiet periods, as represented by the L_{90} level.

The L_{eq} parameter represents the average noise energy during a measurement period. This parameter is derived by integrating the noise levels measured over the measurement period. L_{eq} is important in the assessment of traffic noise impact as it closely corresponds with human perception of a changing noise environment; like traffic noise.

4 EXTERNAL NOISE INTRUSION ASSESSMENT

This section of the report details the acoustic assessment of traffic noise intrusion to the proposed commercial development.

4.1 ACOUSTIC CRITERIA

4.1.1 Australian Standard AS 2107:2000

Australian Standard AS2107 recommends the following design sound level for each of the following spaces internally.

Space /Activity Type	Satisfactory Noise Level dB(A) $L_{Aeq(1hour)}$
Wards	35
Surgeries	40
Operating Theatres	40
Office Areas	40
Nurses Station	40
Laboratories	45
Kitchens	50
Consulting Rooms	40
Corridors and Lobby Spaces	40

4.1.2 NSW Road Noise Policy

Table 4 from the NSW Road Noise Policy states the following.

Table 4 Road traffic noise assessment criteria for non-residential land uses affected by proposed road projects and traffic generating developments

Existing sensitive land use	Assessment criteria – dB(A)		Additional considerations
	Day (7 a.m.–10 p.m.)	Night (10 p.m.–7 a.m.)	
1. School classrooms	$L_{Aeq, (1\ hour)}$ 40 (internal) when in use	–	In the case of buildings used for education or health care, noise level criteria for spaces other than classrooms and wards may be obtained by interpolation from the 'maximum' levels shown in Australian Standard 2107:2000 (Standards Australia 2000).
2. Hospital wards	$L_{Aeq, (1\ hour)}$ 35 (internal)	$L_{Aeq, (1\ hour)}$ 35 (internal)	
3. Places of worship	$L_{Aeq, (1\ hour)}$ 40 (internal)	$L_{Aeq, (1\ hour)}$ 40 (internal)	The criteria are internal, i.e. the inside of a church. Areas outside the place of worship, such as a churchyard or cemetery, may also be a place of worship. Therefore, in determining appropriate criteria for such external areas, it should be established what in these areas may be affected by road traffic noise. For example, if there is a church car park between a church and the road, compliance with the internal criteria inside the church may be sufficient. If, however, there are areas between the church and the road where outdoor services may take place such as weddings and funerals, external criteria for these areas are appropriate. As issues such as speech intelligibility may be a consideration in these cases, the passive recreation criteria (see point 5) may be applied.

4.1.3 Summary of Internal Noise Criteria

Table 1 – Internal Noise Criteria Summary

Space /Activity Type	Satisfactory Noise Level dB(A)$L_{Aeq(1hour)}$
Wards	35 (Day and Night)
Surgeries	40
Operating Theatres	40
Office Areas	40
Nurses Station	40
Laboratories	45
Kitchens	50
Consulting Rooms	40
Corridors and Lobby Spaces	40

4.2 FUTURE TRAFFIC NOISE IMPACTS

4.2.1 Estimated Traffic Volumes

Traffic noise emitted from future roads has been predicted based on expected traffic movements. Traffic volumes used in the assessment are based on information provided in the Traffic Impact and Parking Assessment prepared by Mott MacDonald, dated 17th June 2016. The data for predicted future traffic flow numbers along Digitaria Drive, The Hermitage Way and Gregory Hills Drive in the vicinity of the site are summarised in the following table.

Table 2 – Traffic Volumes on Future Roads

Road	Vehicles per Hour	
	2026 (Full Development) AM Peak	2026 (Full Development) PM Peak
Digitaria Drive	299	587
The Hermitage Way	66	871
Gregory Hills Drive	1395	1708

4.2.2 Predicted Future Traffic Noise Levels

4.2.2.1 Peak Hour Noise Level dB(A)$L_{eq\ 1\ hour}$

Traffic noise predictions have been carried out by CORTN programme and predicted traffic volume above. The predicted traffic noise levels during peak traffic hours are been presented below:

Table 3 –Predicted Traffic Noise Levels-Peak Hour

Location	Predicted Mean Traffic Noise Level During Peak Hour (day time period)
Northern Façade (along Digitaria Drive)	62 dB(A) $L_{eq,\ 1\ hour}$
Western Façade (along The Hermitage Way)	63dB(A) $L_{eq,\ 1\ hour}$
Southern Façade (along Gregory Hills Drive)	61dB(A) $L_{eq,\ 1\ hour}$

5 EVALUATION OF NOISE INTRUSION

Internal noise levels will primarily be as a result of noise transfer through the windows and doors and roof, as these are relatively light building elements that offer less resistance to the transmission of sound. **All external walls are likely to be of masonry construction subject to future detailed design and will not require acoustic upgrading.**

The predicted noise levels through the windows, doors and roof are discussed below. The predicted noise levels have been based on the measured level and spectral characteristics of the external noise, the area of building elements exposed to traffic noise, the absorption characteristics of the rooms and the noise reduction performance of the building elements.

Calculations were performed taking into account the orientation of windows, barrier effects (where applicable), the total area of glazing, facade transmission loss and the likely room sound absorption characteristics. In this way the likely interior noise levels can be predicted.

In all cases, the selected glazing type (refer to Section 5.1) reduces internal noise levels to within the nominated criteria for the various space types.

We note, as this report is for a feasibility study all base building facades and constructions are indicative only.

5.1 RECOMMENDED GLAZING

Refer to Table 4 for recommended glazing assemblies for this project to achieve the internal traffic noise requirements. All external windows and doors listed are required to be fitted with Q-lon type acoustic seals. (**Mohair Seals are unacceptable**).

The glazing thicknesses recommended are those needed to satisfy acoustic requirements and do not take into account other requirements such as structural, safety or other considerations. These additional considerations may require the glazing thickness to be increased beyond the acoustic requirement.

Table 4 – Recommended Glazing Construction

Façade	Space	Glazing	Acoustic Seals
All	Lobby	6.38mm Laminate	Yes
West	All Spaces	6.38mm Laminate	
East		10.38mm Laminate	
North		10.38mm Laminate	
South		6.38mm Laminated	

In addition to meeting the minimum glazing thickness requirements given, the design of the window mullions, perimeter seals and the installation of the windows/doors in the building openings shall not reduce the STC rating of the glazing assembly below the values nominated in the table above. **Note that mohair type seals will not be acceptable for the windows requiring acoustic seals.**

Table 5 – Minimum STC of Glazing (with Acoustic Seals)

Glazing Assembly	Acoustic Seals	Minimum STC of Installed Window
6.38mm Laminate	Yes	31
10.38mm Laminate	Yes	33

5.2 EXTERNAL DOORS

Any glass door should be constructed using glazing thickness set out in Table above. Full perimeter acoustic seals around the doors are required. It will be acoustically acceptable if thicker glazing is required for structural or comfort purposes, the glazing recommended in Table above is a minimum requirement.

5.3 ROOF / CEILING CONSTRUCTION

Proposed construction for the external roof will composed of concrete elements, this will be sufficient in satisfying acoustic requirements. If any penetration is required through the external roof for services, ensure all gaps in the penetration have been sealed with acoustic sealant.

5.4 EXTERNAL WALLS

Proposed construction for the external walls will composed of either concrete or masonry elements, this will be sufficient in satisfying acoustic requirements. If any penetration is required through the external walls for services, ensure all gaps in the penetration have been sealed with acoustic sealant. Light weight walls shall be acoustically reviewed by this office before construction.

5.5 MECHANICAL VENTILATION

With respect to natural ventilation of the internal spaces, the NSW Department of Planning document "Development near Busy Roads and Rail Corridors - Interim Guideline" dictates that:

- *"If internal noise levels with windows or doors open exceed the criteria by more than 10dB(A), the design of the ventilation for these rooms should be such that occupants can leave windows closed, if they so desire, and also to meet the ventilation requirements of the Building Code of Australia."*

With windows open, the allowable internal noise goal is permitted to be 10dB(A) higher than when the windows are closed (ie – allowable level in any internal spaces becomes 45dB(A), and 50dB(A) in living rooms).

All internal spaces of the whole development will require to have their windows closed in order to meet acoustic requirements. A mechanical engineer is to confirm if supplementary ventilation (to meet Australian Standard AS1668.2 requirements) will be required to these rooms.

6 VIBRATION ASSESSMENT

This section of the report will discuss the impacts from vibration emitting from the project site to the surrounding receivers of the project site.

6.1 VIBRATION CRITERIA

Vibration impacts which has been assessed in this report, will be assessed against the requirements of the NSW EPA Document - Assessing Vibration: Technical Guideline 2006.

6.1.1 NSW EPA Document - Assessing Vibration: Technical Guideline 2006

Table 2.2 below shows the maximum RMS values for exposure to continuous or impulsive vibration.

Table 2.2 Preferred and maximum weighted rms values for continuous and impulsive vibration acceleration (m/s^2) 1–80 Hz

Location	Assessment period[1]	Preferred values		Maximum values	
		z-axis	x- and y-axes	z-axis	x- and y-axes
Continuous vibration					
Critical areas[2]	Day- or night-time	0.0050	0.0036	0.010	0.0072
Residences	Daytime	0.010	0.0071	0.020	0.014
	Night-time	0.007	0.005	0.014	0.010
Offices, schools, educational institutions and places of worship	Day- or night-time	0.020	0.014	0.040	0.028
Workshops	Day- or night-time	0.04	0.029	0.080	0.058
Impulsive vibration					
Critical areas[2]	Day- or night-time	0.0050	0.0036	0.010	0.0072
Residences	Daytime	0.30	0.21	0.60	0.42
	Night-time	0.10	0.071	0.20	0.14
Offices, schools, educational institutions and places of worship	Day- or night-time	0.64	0.46	1.28	0.92
Workshops	Day- or night-time	0.64	0.46	1.28	0.92

1 Daytime is 7.00 am to 10.00 pm and night-time is 10.00 pm to 7.00 am

2 Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. There may be cases where sensitive equipment or delicate tasks require more stringent criteria than the human comfort criteria specified above. Stipulation of such criteria is outside the scope of this policy, and other guidance documents (e.g. relevant standards) should be referred to. Source: BS 6472–1992

6.2 DICSUSSION

As detailed design of any mechanical plant is not known at this stage, a detailed review cannot be undertaken at Concept D.A Stage. A detailed assessment should be carried out at future D.A or CC stages to ensure compliance with the requirements above.

7 EXTERNAL NOISE EMISSION

7.1 NOISE RECEIVERS

Nearest residential receivers are located to the immediate east and north of the project, see figure 1.

7.2 BACKGROUND NOISE MONITORING

Background noise levels for the site were obtained using an unattended noise logger.

The unattended monitoring was conducted using an Acoustic Research Laboratory's noise logger. The logger was set to A-weighted fast response and was programmed to store 15-minute statistical noise levels throughout the monitoring period. The monitor was calibrated at the start and end of the monitoring period using a Rion NC-73 calibrator. No significant drift was noted.

The unattended measurement was conducted from the 20th May 2016 to 27th May 2016. Refer to the aerial photo in Figure 1 afore for the noise monitor location.

The measured background noise levels are summarised in Table 6 below.

Table 6 - Measured Rating Background Noise Levels

Location	Day Noise Level 7am to 6pm dB(A) L_{90}	Evening Noise Level 6pm to 10pm dB(A) L_{90}	Night Noise Level 10pm to 7am dB(A) L_{90}
Gregory Hills Commercial Precinct See Figure 1	44	39	35

7.3 NOISE EMISSION OBJECTIVES

Noise emissions from the development will have to achieve the following requirements.

7.3.1 NSW EPA Industrial Noise Policy

The NSW EPA Industrial Noise Policy, has two criteria which need to be satisfied namely Intrusiveness and Amenity. These are described below:

- *Intrusiveness Criteria* - This guideline is intended to limit the audibility of noise emissions at residential receivers and requires that noise emissions measured using the L_{eq} descriptor not exceed the background noise level by more than 5 dB(A). Where applicable, the intrusive noise level should be penalised (increased) to account for any annoying characteristics such as tonality.

- *Amenity Criteria* - This guideline is intended to limit the absolute noise level from all "industrial" noise sources such as mechanical plant to a level that is consistent with the general environment.

The EPA's Industrial Noise Policy sets out acceptable noise levels for various localities. Table 2.1 on page 16 of the policy indicates 4 categories to distinguish different residential areas. They are rural, suburban, urban and urban/industrial interface.

Noise levels are to be assessed at the property boundary or nearby dwelling, or at the balcony or façade of an apartment.

7.3.1.1 Intrusiveness Criterion

The guideline is intended to limit the audibility of noise emissions at residential receivers and requires that noise emissions measured using the L_{eq} descriptor do not exceed the background noise level by more than 5dB(A). Where applicable, the intrusive noise level should be penalised (increased) to account for any annoying characteristics such as tonality.

Background noise levels adopted are presented in Section 5.1. Noise emissions from the site should comply with the noise levels presented in Table 7 below when measured at nearby property boundary.

Table 7 - Intrusiveness Noise Emission Goals

Location	Period/Time	Intrusiveness Noise Emission Goal dB(A) $L_{eq(15min)}$
Nearby Residences (North and East of Proposed Site)	Day (7am-6pm)	49
	Evening (6pm-10pm)	44
	Night (10pm-7am)	40

7.3.1.2 Amenity Criterion

The guideline is intended to limit the absolute noise level from all noise sources to a level that is consistent with the general environment.

The NSW EPA Industrial noise policy sets out acceptable noise levels for various localities. Table 2.1 on page 16 of the policy indicates 4 categories to distinguish different areas. They are rural, suburban, urban and urban/industrial interface. This site is categorised by urban receivers.

For the purposes of this condition:

- Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays;
- Evening is defined as the period from 6pm to 10pm.
- Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and public holidays.

Table 8 - Amenity Noise Emission Goals

Location	Period/Time	Amenity Noise Emission Goal dB(A) $L_{eq(Period)}$
Nearby Residences –urban Receiver	Day (7am-6pm)	60
	Evening(6pm-10pm)	55
	Night(10pm-7am)	45

7.3.2 Resultant Project Noise Emission Criteria

Based on the requirements stated in the sections above, Table 9 provides a summary of the assessment criteria applicable to the future residential development at the proposed site. The assessment criteria are also based on the background noise monitoring data conducted at the proposed development location.

Table 9 - Environmental Noise Emission Criteria

Time Period	Assessment Background Noise Level dB(A)L_{90}	Amenity Criteria dB(A) L_{eq}	Intrusiveness Criteria Background + 5 dB(A) L_{eq}(15min)	EPA Criteria for Sleep Disturbance dB(A) L_{eq}(15min)
Day	44	60	49	N/A
Evening	39	55	44	N/A
Night	35	45	40	50

7.4 SLEEP AROUSAL ASSESSMENT

Potential sleep arousal impacts should be considered for noise generated before 7am or after 10pm.

Short duration, intermittent noise events (such as cars driving into the car park) are typically assessed for potential sleep disturbance.

Potential impacts are assessed using the recommended procedure in the Application Notes to the EPA Industrial Noise Policy. As recommended in the Application Notes, when assessing potential sleep arousal impacts, a two stage test is carried out:

- Step 1 - An “emergence” test is first carried out. That is, the L_1 noise level of any specific noise source should not exceed the background noise level (L_{90}) by more than 15 dB(A) outside a resident’s bedroom window between the hours of 10pm and 7am. If the noise events are within this, then sleep arousal impacts are unlikely and no further analysis is needed. This is consistent with the Noise Guide for Local Government. The guideline level is set out below.

Table 7 – Sleep Arousal (Emergence Criteria)

Location	Background Noise Level (5am-7am) dB(A)$_{L90}$	Emergence Level dB(A) $L_{1(1min)}$
Gregory Hills Commercial Precinct See Figure 1	43	58

- Step 2 - If there are noise events that could exceed the emergence level, then an assessment of sleep arousal impact is required to be carried out taking into account the level and frequency of noise events during the night, existing noise sources, etc. This test takes into account the noise level and number of occurrences of each event with the potential to create a noise disturbance. As is recommended in the explanatory notes of the EPA Industrial Noise Policy, this more detailed sleep arousal test is conducted using the guidelines in the EPA Road Noise Policy. Most relevantly, the Road Noise Policy states:

  For the research on sleep disturbance to date it can be concluded that:

  - *Maximum internal noise levels below 50-55dB(A) are unlikely to awaken people from sleep.*

  - *One to two noise events per night with maximum internal noise levels of 65-70dB(A) are not likely to affect health and wellbeing significantly.*

The internal noise level guidelines have also been adopted in this assessment.

7.5 MECHANICAL PLANT

Detailed plant selection has not been undertaken at this stage, as plant selections have not been determined. Detailed acoustic review should be undertaken at CC stage to determine acoustic treatments to control noise emissions to satisfactory levels. Satisfactory levels will be achievable through appropriate plant selection and location and, if necessary, standard acoustic treatments such as duct lining, acoustic silencers and enclosures. Noise emissions from all mechanical services plant to the closest residential receiver should comply with the noise emission criteria in Section 5.2 of this report.

7.6 CAR PARK NOISE

7.6.1 Ground Level Open Car Park (The Hermitage Way)

This section of the report presents our assessment of operational noise emissions from the proposed outdoor car park.

7.6.1.1 Noise Sources

Noise emissions at the nearest residences will be predicted based on the following assumptions:

The potential noise source associated with the use of the driveway and carpark is listed in Table 10 below, also listed is the noise emission levels for each activity. The emission levels have been obtained from noise measurements carried out at similar facilities.

Noise measurements were obtained using a Norsonic SA 110 with (serial number 24692) or CEL-593 Type 1 sound level analysers (serial number C1. T 116962), set to fast response. The sound level analysers were calibrated before and after the measurements using a Rion NC-73 calibrator. No significant drift was recorded.

Table 10 – Noise Source Emission Levels

Noise Source	Sound Power Level dB(A)	Type of Noise Source
Car Manoeuvring	84	Quasi-Steady
Car Start	65 dB(A) L_1 @ 7m	Instantaneous
Door Slamming	68 dB(A) L_1 @ 7m	Instantaneous

7.6.1.2 Predicted Noise Emissions

Noise levels are predicted at the property boundaries of the nearest residential receivers, and is shown below in the following tables. All predictions are based on the assumption that the acoustic treatments and management controls outlined in Section 7.6.1.3 are adopted.

7.6.1.2.1 Predicted Noise Levels

Noise emission from the operation of the driveway, car park and ambulance has been predicted based on the noise level data presented in Section 7.6.1.1, and the assumptions presented below.

- The car park can hold a maximum of 211 vehicles at any one time.
- Calculations are based on up to 50% of car park spaces occupied or vacated during one-hour time period (day time).

The predicted noise levels at the nearest residential receivers are presented in the table below.

Table 11 - Predicted External Open Air Car Park Noise Level (The Hermitage Way)

Receiver	Predicted Noise Level	Criteria	Compliance
Receiver 1 and 2 (See figure 1)	42 dB(A)L_{eq}	Day – 49 dB(A)L_{eq}	Yes
	42 dB(A)L_{eq}	Evening- 44 dB(A)L_{eq}	Yes
	39 dB(A)L_{eq}	Night – 40 dB(A)L_{eq}	Yes*

*No detailed traffic movement data available at this stage, it is reasonably assume that the vehicle movements during night time period will be half of day time period.

Door slamming/ car start noise emission during night time period has been predicted below.

Table 12 –Sleeping Disturbance Noise Prediction

Receiver	Predicted Noise Level	Criteria	Compliance
Receiver 1 and 2 (See figure 1)	Door Slamming- 49 dB(A)L_{Max}	50 dB(A)$L_{1,\ 1min}$	Yes
	Car Start-46 dB(A)L_{Max}		

7.6.1.3 Discussion

Detailed assessment has been undertaken to predict the noise emissions from the movements of the external open air car park located along the eastern and western boundary. We note, from site investigations details regarding the existing receivers building height and boundary fence have been taken into account. Based off the boundary permitter fence at a height of 1.8m high, compliance can be achieved.

Additionally, management controls should be enforced to ensure existing acoustic amenity is achieved. Installing signs at all entry and exit points to the site reminding visitors and motorist too cautious of their noise when on site at all times.

7.6.2 Ambulance Noise

- With respect to noise from ambulances, being an emergency vehicle, ambulance noise is not subject to the noise emission requirements of the Industrial Noise Policy, however, we note:
    - Sirens to ambulances are not typically used within the site. Typically, the only exception to this would be for a short duration burst to alert motorists within the site. We would expect this would not typically be necessary during night time periods, as there will be much fewer motorists on the site at this time.
    - The Ambulance Bay is located over 100m away from the residences. Noise from an ambulance idling in the ambulance bay would not be expected to be audible at these residences.

8 CONCLUSION

This report provides the results of our acoustic assessment of the feasibility of the proposed medical precinct on the amenity of future tenants and surrounding neighbours within the proposed site at Gregory Hills Corporate Park.

Provided that the treatments set out in section 5 of this report are employed, internal noise levels shall comply with the requirements below:

- Australian Standard AS: 2107:2000 and;
- NSW Road Noise Policy and;
- SEARs.

Vibration emissions criteria has been setup in this report to satisfy the requirements from NSW EPA Assessing Vibration: Technical Guideline 2016 and SEARs. A detailed vibration assessment for the plant servicing the proposed development will be determined at CC stage.

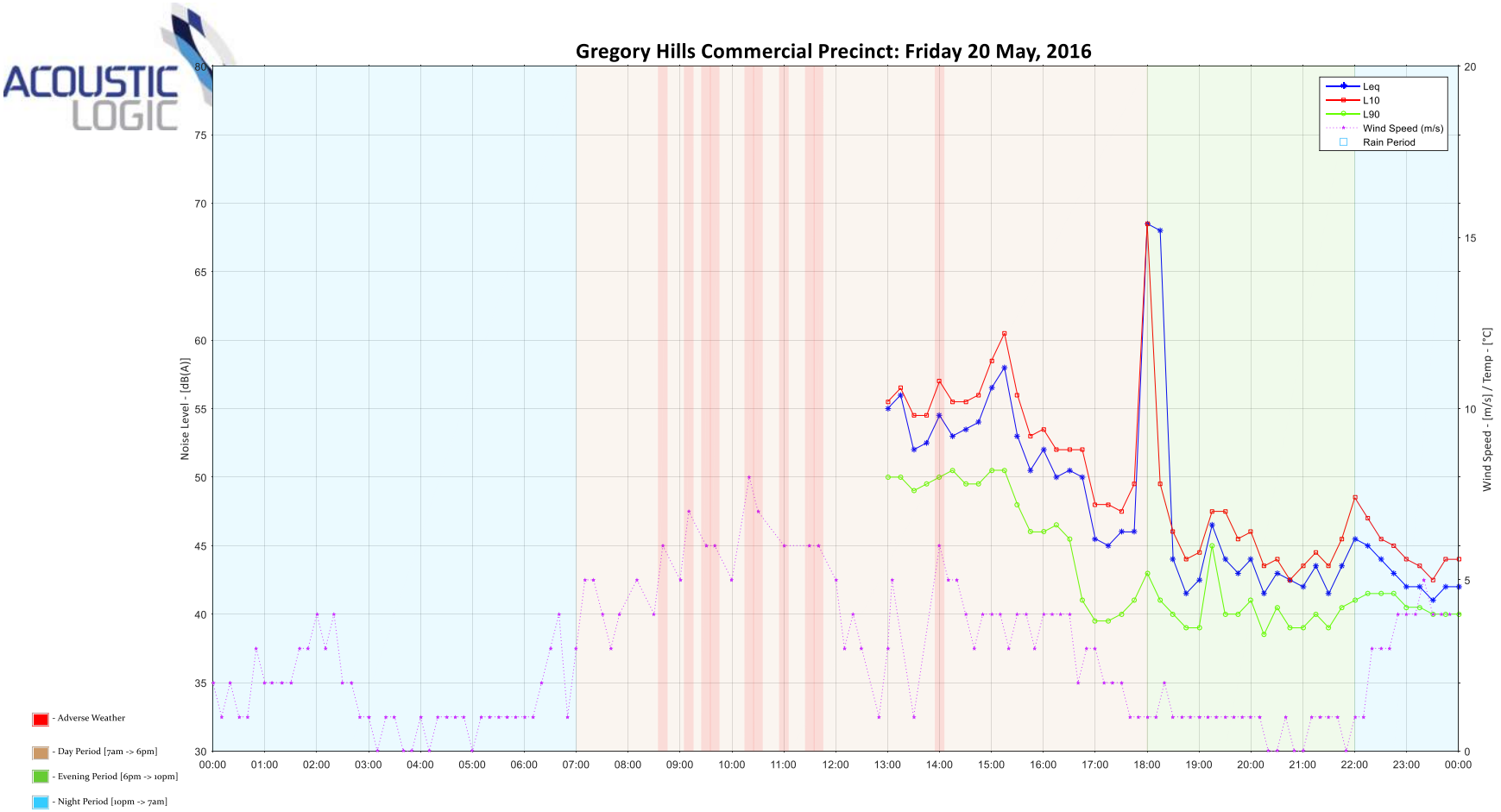
External noise emissions criteria have been setup in this report to satisfy the requirements from NSW EPA Industrial Noise Policy and SEARs, noise control for the carpark has been recommended in Section 6.5 of this report while the detailed acoustic controls measure for the plant service the proposed development will be determined at CC stage.

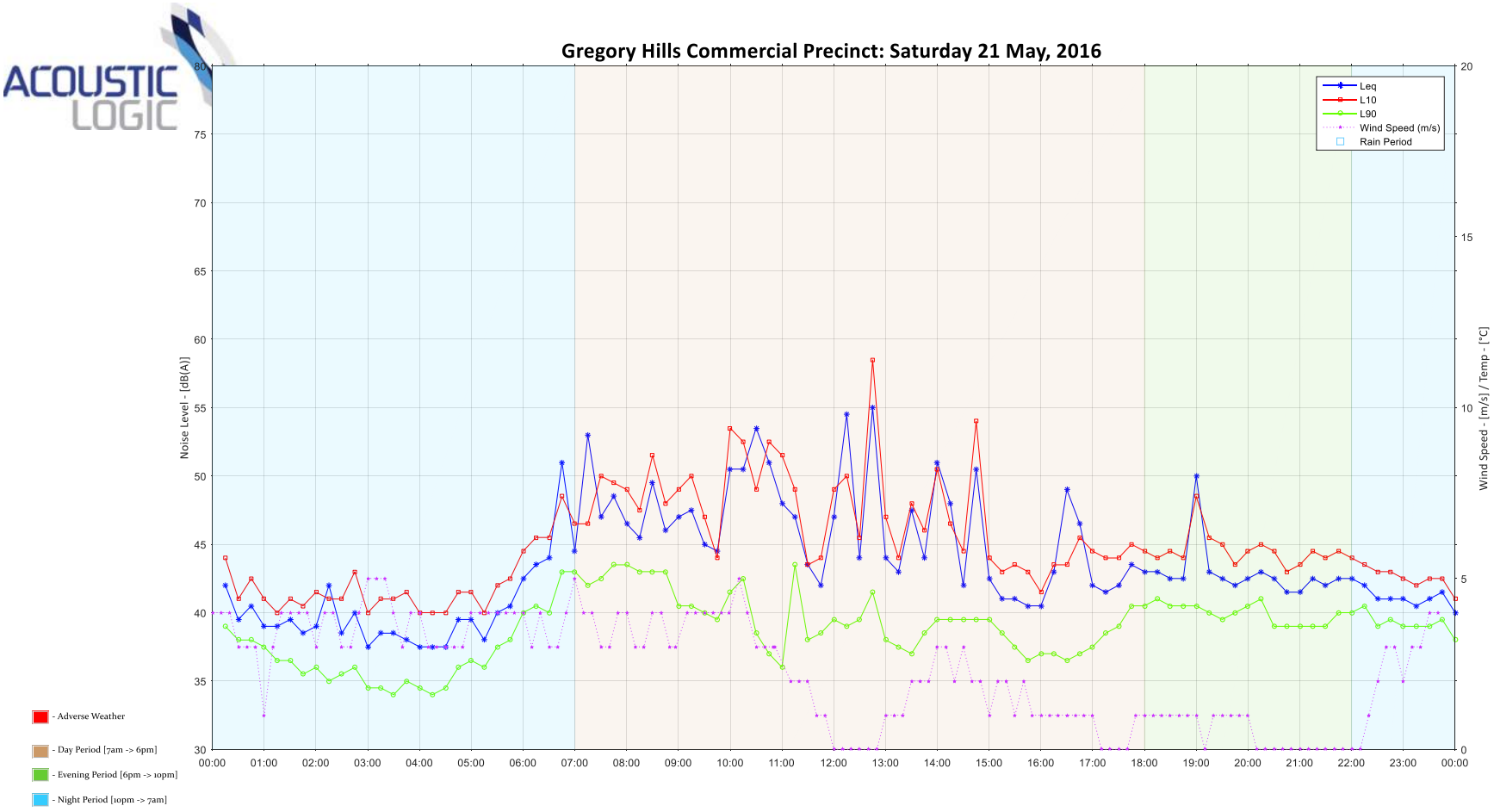
We trust this information is satisfactory. Please contact us should you have any further queries.

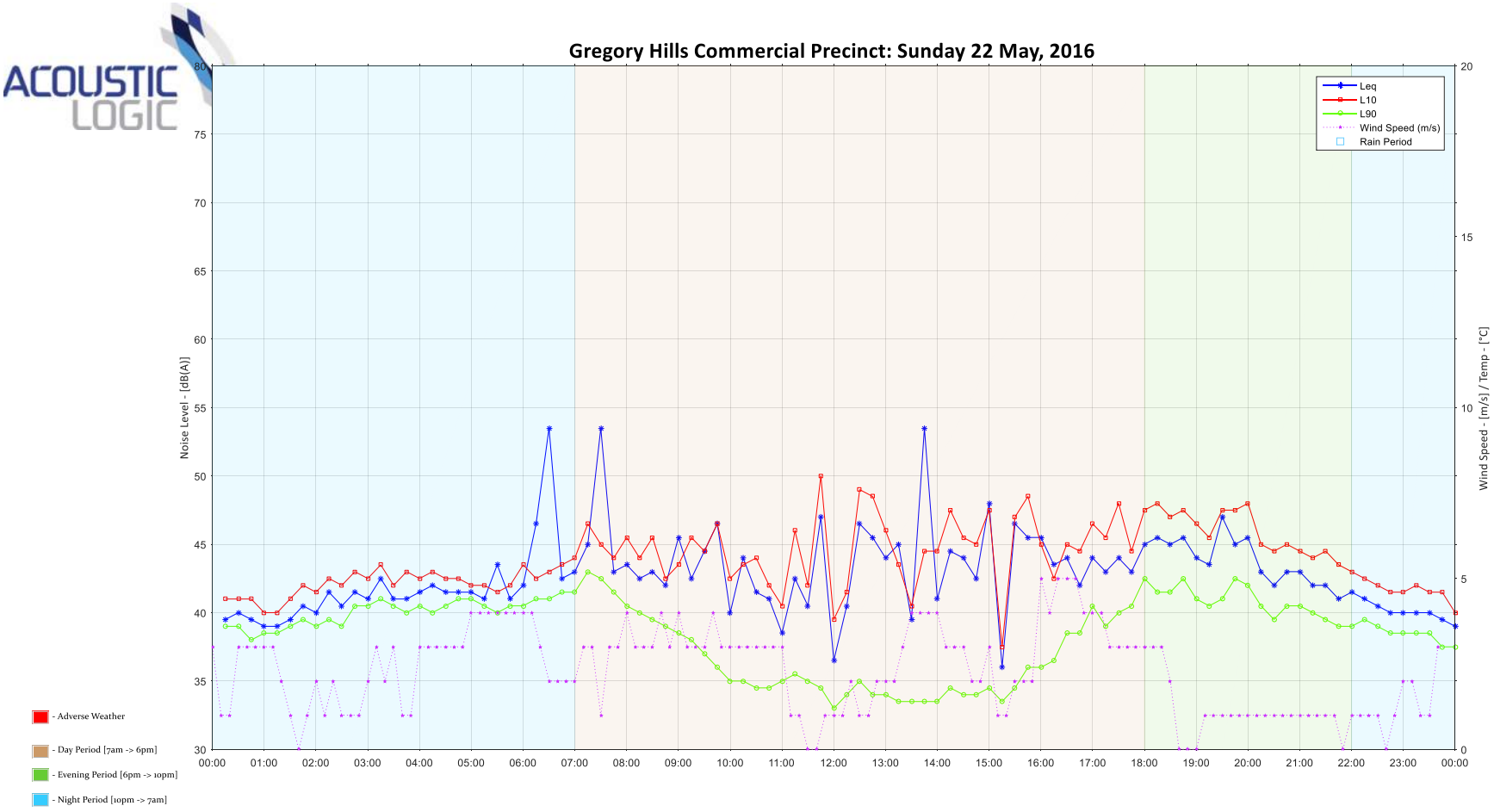
Yours faithfully,

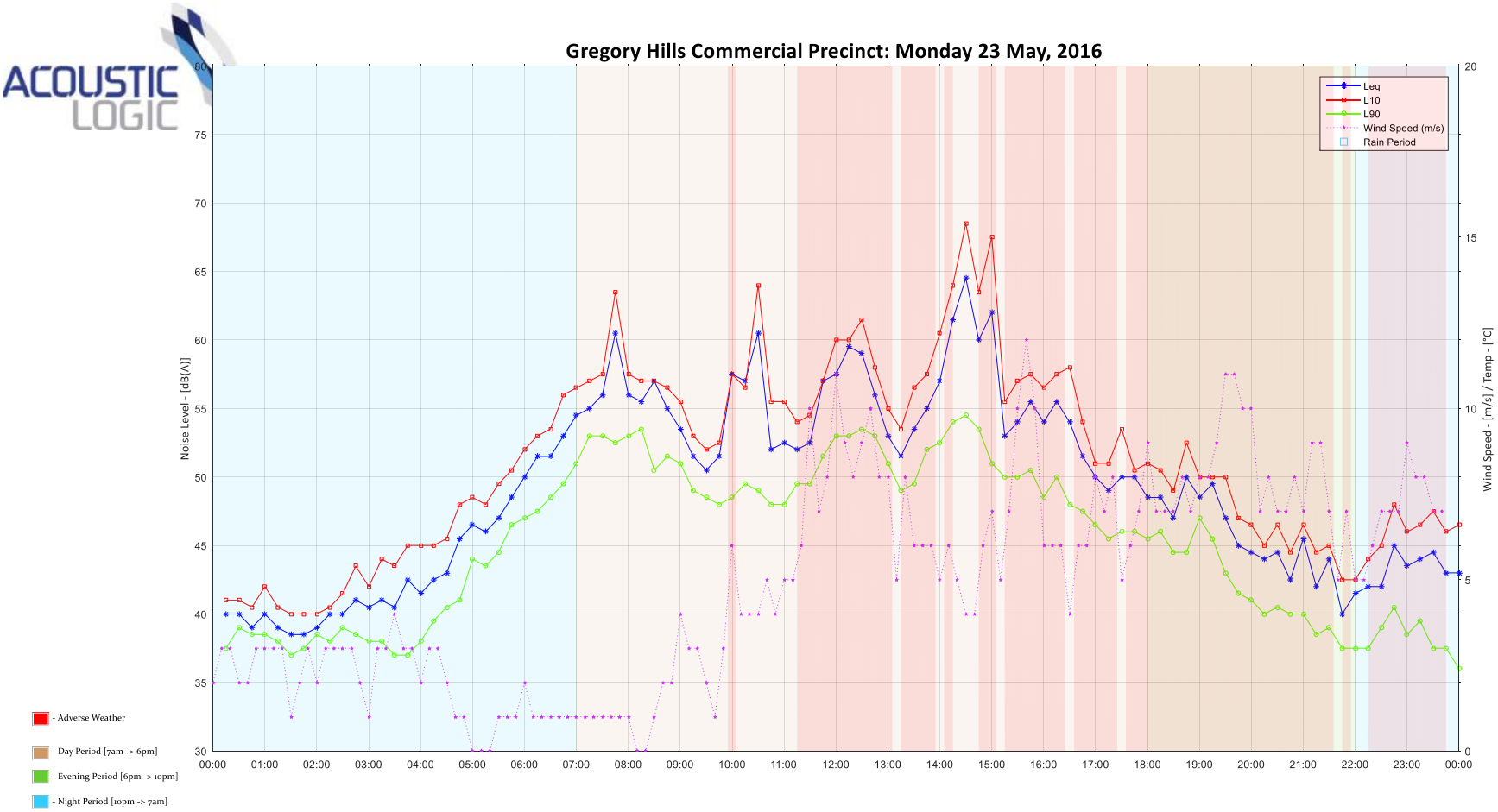
Acoustic Logic Consultancy Pty Ltd
Matthew Furlong

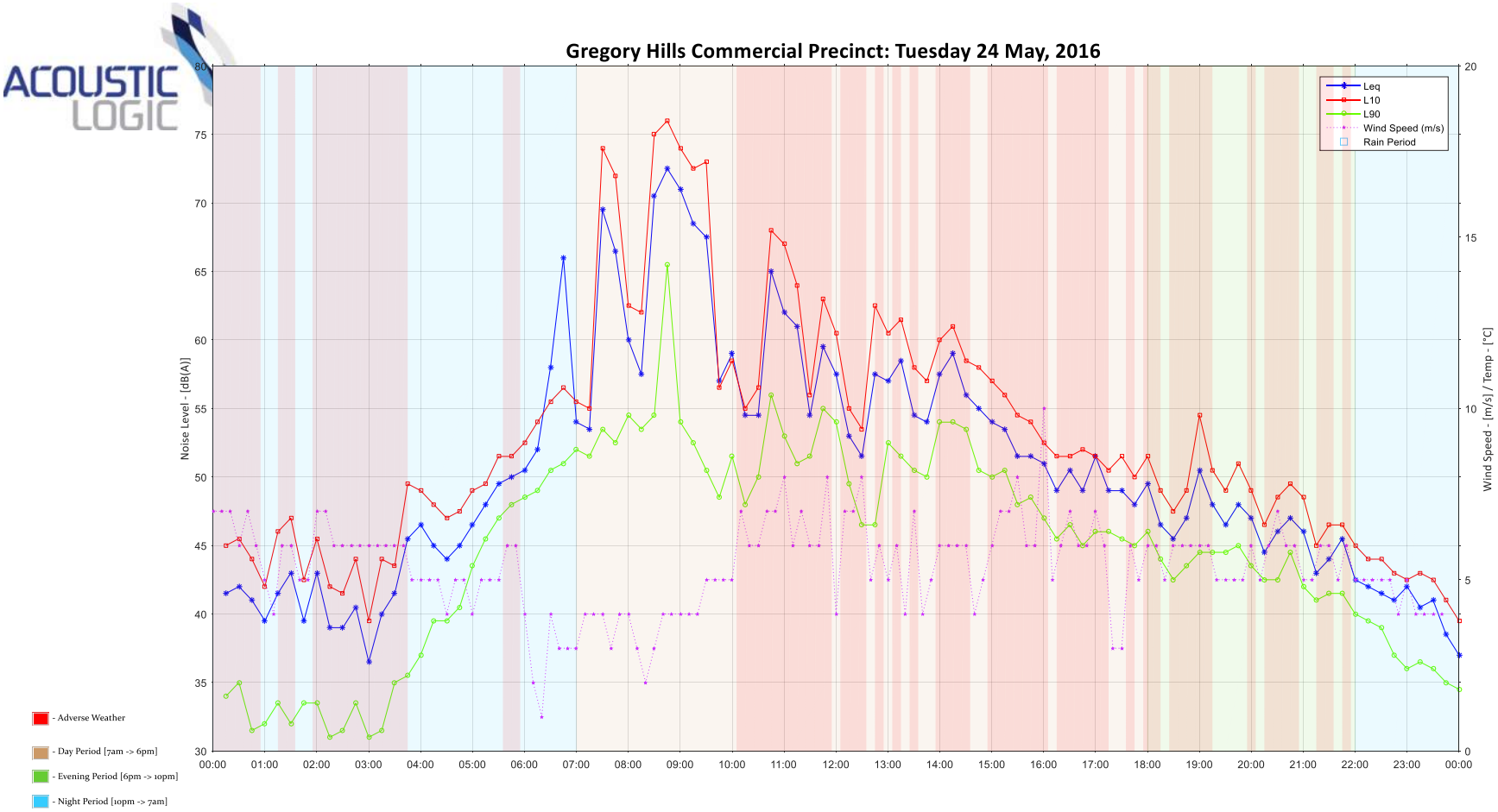
APPENDIX A – UNATTENDED NOISE MONITOR DATA

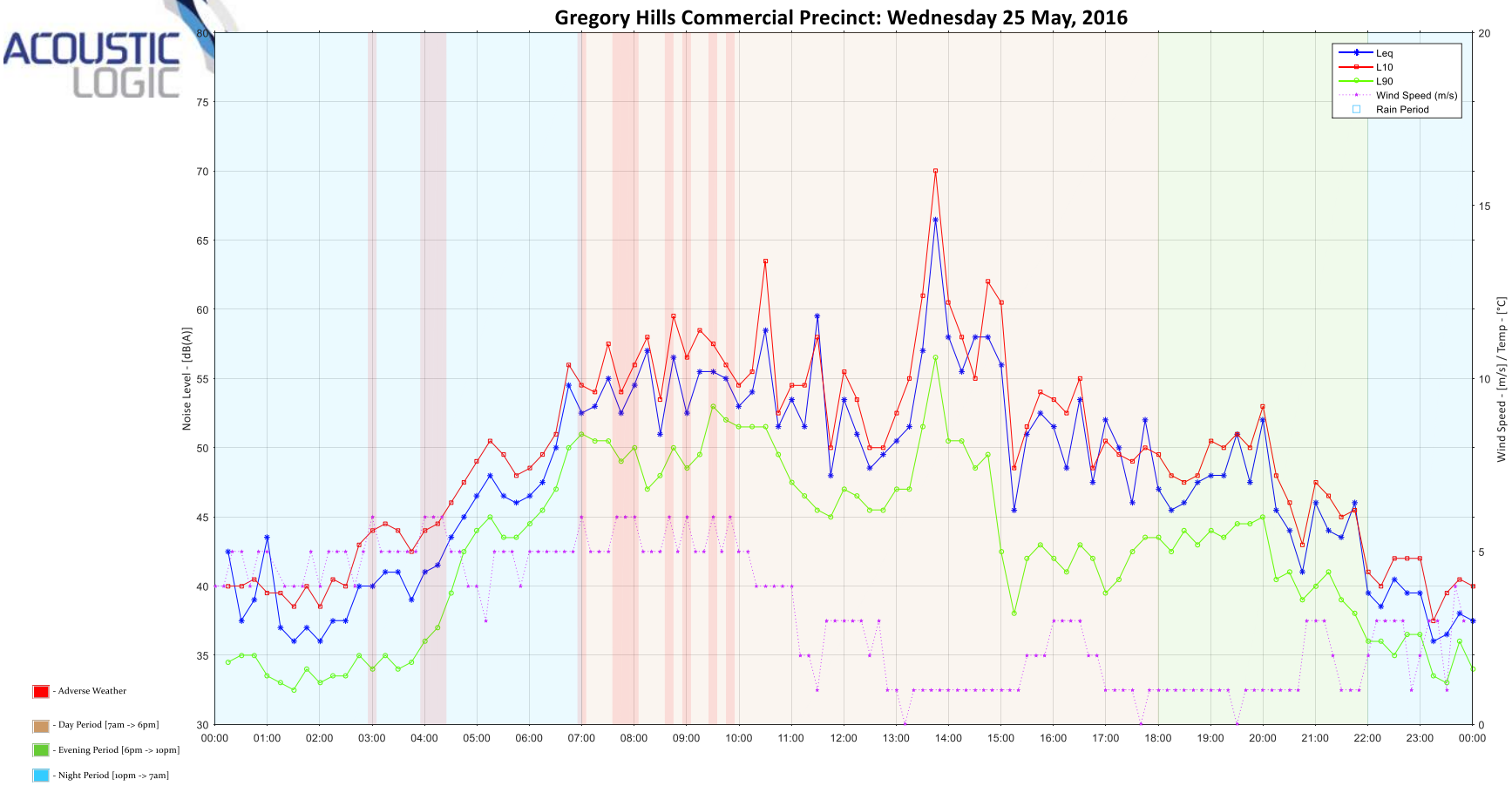

Gregory Hills Commercial Precinct: Friday 20 May, 2016
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

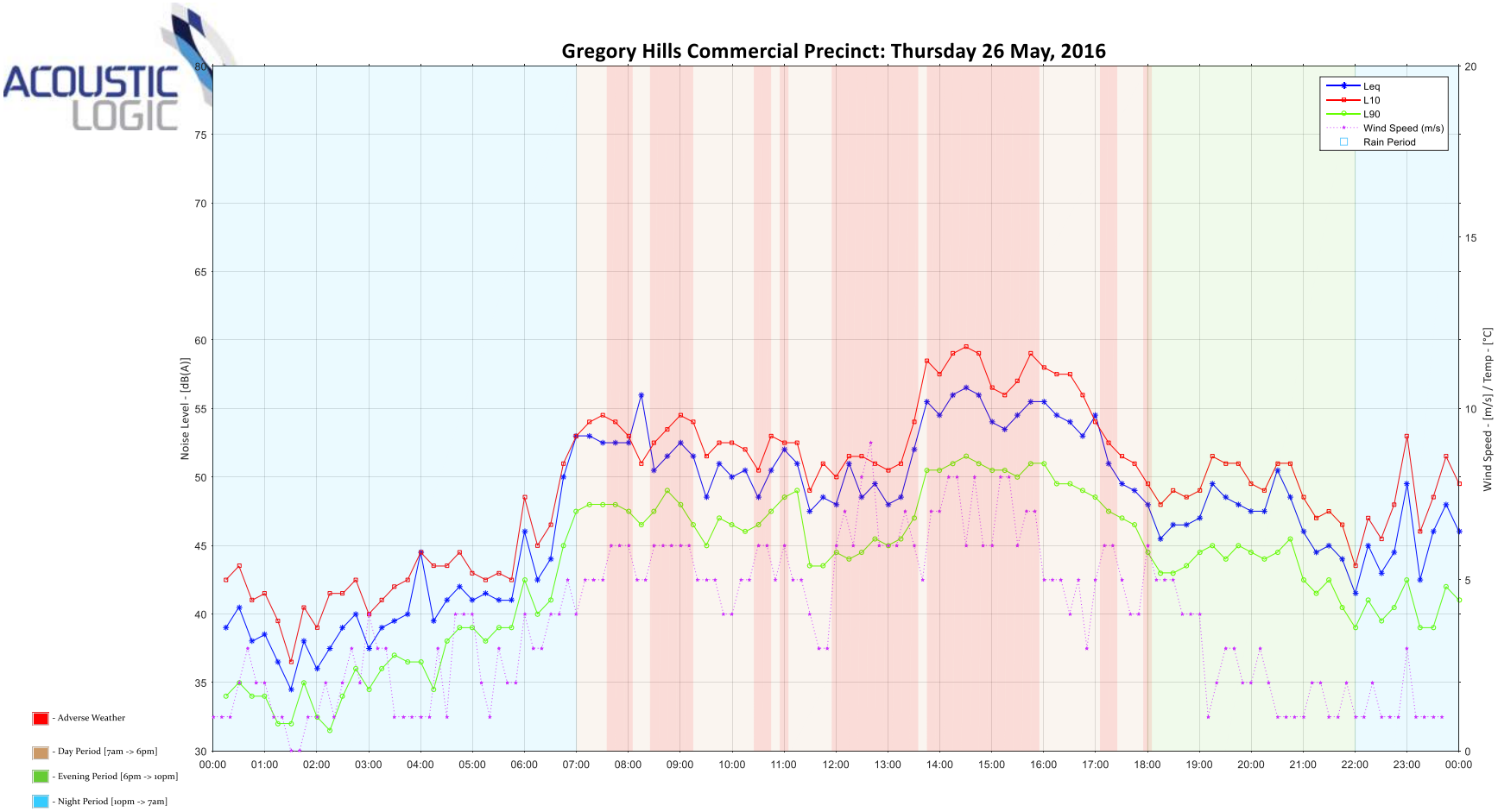

Gregory Hills Commercial Precinct: Saturday 21 May, 2016
Leq
L10
L90
Wind Speed (m/s)
Rain Period
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
80
75
70
65
60
55
50
45
40
35
30
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

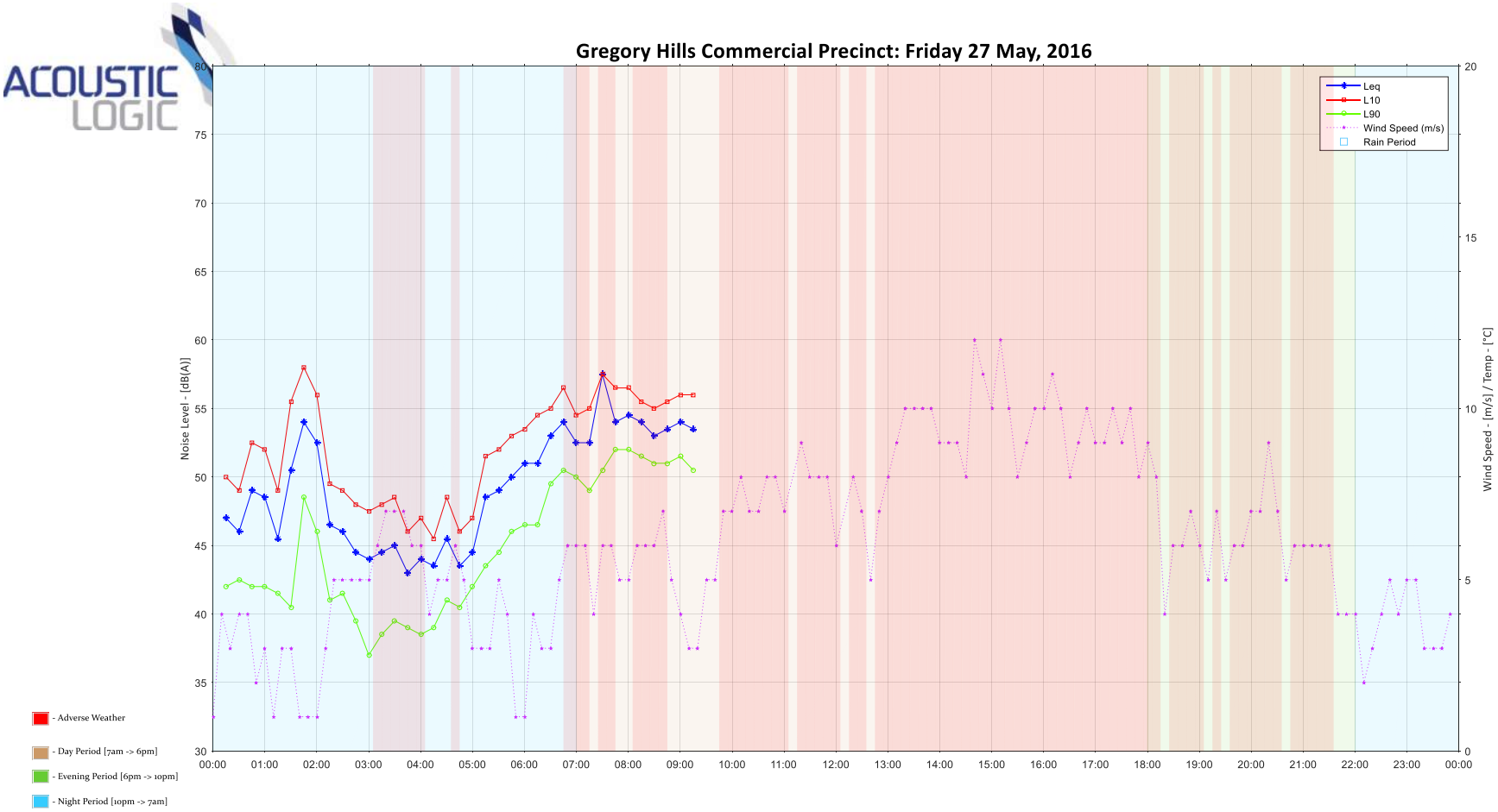

Gregory Hills Commercial Precinct: Sunday 22 May, 2016
Leq
L10
L90
Wind Speed (m/s)
Rain Period
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
80
75
70
65
60
55
50
45
40
35
30
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


Gregory Hills Commercial Precinct: Monday 23 May, 2016
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


Gregory Hills Commercial Precinct: Tuesday 24 May, 2016
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


Gregory Hills Commercial Precinct: Wednesday 25 May, 2016
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


Gregory Hills Commercial Precinct: Thursday 26 May, 2016
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


Gregory Hills Commercial Precinct: Friday 27 May, 2016
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]